

Canadian Institute of
Guided Ground Transport
Queen's University
at Kingston, Ontario

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prepared for

Transportation Development Centre
Policy and Coordination Group
Transport Canada

January 1990

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**Potential Impact on Canada of Proposed
New ISO Standards for Large International
Freight Containers**

prepared by

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Transportation Development Centre
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Any errors are, of course, the sole responsibility of the author. The views expressed are also the sole responsibility of the author.

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Un sommaire en français de ce rapport est inclus avant la Table des matières.

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16. Abstract The International Standards Organization (ISO) is attempting to develop standards for containers larger than the current 12.19 m x 2.44 m x 2.90 m "high cube" box. In the meantime, there has been a proliferation of non-ISO boxes, including the new 14.63 m x 2.59 m x (up to) 2.90 m box used in North America. This study looks at the impact of these larger containers on Canadian railways; truckers and terminal operators at the three larger container ports on Canadian railways; truckers and terminal operators at the three major container ports; and on the highway system. If the most likely scenario is a container with the same maximum weight as the current 12.19 m container (30.48 tonnes), with a width of 2.6 metres (the same as highway trailers), with an increased length to the range of 14.63 to 14.94 metres, <u>and</u> with lifting points compatible with current ISO containers, then the transportation industry will have little difficulty adjusting. Over the longer term, shippers and ultimately consumers will benefit if a new, larger cube box reduces transportation costs. Both major Canadian railways are already acquiring equipment that can accommodate any of the future containers being considered by ISO. The one regulatory problem that may be encountered is that some provinces limit semitrailer lengths to 14.65 metres. However, through one of several mechanisms, most provinces and territories will be able to accommodate new ISO containers in the range of 14.63 to 14.94 metres.				
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16. Résumé L'ISO étudie actuellement un projet de normalisation de conteneurs de capacité supérieure à ceux des actuels conteneurs de 12,19 x 2,44 x 2,90 mètres. Entre temps, on assiste à une prolifération de conteneurs non normalisés de toutes les dimensions, dont le nouveau modèle de 14,63 x 2,59 x 2,90 mètres (max.) en usage en Amérique du Nord. La présente étude a pour objet d'évaluer l'impact que pourrait avoir une nouvelle classe de gros conteneurs ISO sur les divers secteurs de l'industrie canadienne des transports, et notamment les compagnies ferroviaires, les entreprises de camionnage, les exploitants de terminaux dans les trois principaux ports équipés pour la manutention des conteneurs, et sur l'infrastructure routière. À supposer que l'ISO privilégie pour son nouveau conteneur la même masse brute maximale que l'actuel conteneur de 12,19 mètres (soit 30,48 tonnes), une largeur de 2,6 mètres (comme les remorques routières), une longueur de 14,63 à 14,94 mètres, et des points de levage conformes aux normes ISO actuellement en vigueur, l'industrie canadienne du transport aurait alors peu de difficulté à s'adapter. L'utilisation de plus gros conteneurs, si elle mène à une réduction des coûts de transport, profitera à long terme aux expéditeurs et aux consommateurs. Les deux grandes compagnies ferroviaires canadiennes ont déjà commencé à s'équiper pour pouvoir manutentionner et transporter tous les nouveaux modèles de conteneurs considérés par l'ISO. Le seul problème que l'on entrevoit touche la réglementation routière, la longueur limite autorisée des semi-remorques étant de 14,65 mètres dans certaines provinces. Toutefois, il existe plusieurs solutions pratiques qui permettraient la circulation de conteneurs de 14,63 à 14,94 mètres dans la plupart des provinces et territoires du Canada.				
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EXECUTIVE SUMMARY

The International Standards Organization (ISO) is developing standards for a new series of large containers — that is, larger than the current 12.19 metres (40 feet) long, 2.44 metres (9.5 feet) wide, 2.90 metres (9.5 feet) high box. While it considers appropriate weights and dimensions for these new containers, various non-ISO containers are appearing. In the United States, lengths of 13.72 m (45 ft), 14.63 m (48 ft), and even 16.5 m (53 ft) are now in use and widths of 25.9 m (102 in.) are standard for 14.63 m (48 ft) and 16.15 m (53 ft) containers. Standards have also been proposed for domestic containers in the US. In Canada there are a number of non-ISO containers used for domestic freight and new services with non-ISO standards are being planned. In Europe, non-ISO widths of 2.5 metres (8.2 ft) are common for containers and swap bodies. There is a danger that without a new international standard the integrity of the world's containerized freight system will be jeopardized.

If the ISO adopts a standard with the same maximum weight as the current 40-foot container (30.48 tonnes), a width of 2.6 metres (8.5 ft) (the same as highway trailers), an increased length in the range of 14.63 m (48 ft) to 14.93 m (49 ft), and lifting points compatible with current containers, then industry in Canada will have little difficulty adjusting. Over the longer term, shippers and ultimately consumers will benefit if a larger container reduces transportation costs, as it has done in the United States.

Terminal operators, railways, and truckers will have to make some adjustments to accommodate larger containers: spreaders used to lift containers may have to be modified; some new lifting equipment may have to be purchased; new trailer chassis may have to be acquired; yard layouts may have to be modified; terminal productivity may fall slightly with more container sizes. But, these adjustments aside, no one interviewed during the course of this research could identify any insurmountable problems. In fact, the railways are already acquiring equipment that can accommodate any container being considered by the ISO.

One problem that may be encountered is the semitrailer length limit of 14.65 metres (48 ft) in some provinces. It appears, though, that most provinces and territories will be able to accommodate new containers in the range of 16.43 to 14.94 metres (48 to 49 feet) by:

- (i) adopting a 16.2 m (53 ft) length limit;
- (ii) allowing the movement under permit; or
- (iii) allowing the movement on a 14.63 m (48 ft) chassis as current regulations permit a certain amount of overhang.

Other than this one road policy, there is no major policy change required by any level of government. If industry does need assistance, governments should simply be in support of whatever standards industry experts feel best fulfil the needs of four goals:

- (i) a standard that is compatible with or causes the least disruption to over-the-road dimensional and weight limits;
- (ii) a standard that is compatible with the most common unit load and pallet sizes;

- (iii) a standard that allows the development of a complementary "half-size" container that is also optimal with respect to widely used unit load and pallet sizes; and
- (iv) a standard that allows the movement of low-density freight in a more efficient manner than now possible with existing ISO containers.

SOMMAIRE

L'Organisation internationale de normalisation (ISO) étudie présentement un projet de normalisation de conteneurs de capacité supérieure à celle des actuels conteneurs de 12,19 mètres de long sur 2,44 mètres de large sur 2,90 mètres de haut, et considère à cette fin les dimensions et la masse brute maximale à adopter. Entre temps, des conteneurs de diverses dimensions non normalisées sont mis en circulation. Aux États-Unis, on voit maintenant des conteneurs de 13,72 mètres, 14,63 mètres et même 16,15 mètres, et la largeur normale des conteneurs de 14,63 mètres et de 16,15 mètres est de 2,59 mètres. On a même proposé d'adopter des normes différentes des normes ISO pour les conteneurs destinés au transport intérieur. Au Canada aussi, on utilise des conteneurs de dimensions diverses, non conformes aux normes ISO, pour le transport intérieur. On envisage même de créer de nouveaux services de transport utilisant des conteneurs de dimensions normalisées, mais différentes de celles des conteneurs ISO. En Europe, les conteneurs et caisses mobiles de 2,5 mètres de largeur sont courants. Il est à craindre qu'en l'absence d'une nouvelle norme internationale, la compatibilité entre systèmes de transport conteneurisé à travers le monde soit compromise.

En supposant que l'ISO privilégie un modèle de 14,63 à 14,94 mètres de longueur, de 2,6 mètres de largeur (comme les remorques routières), de même masse brute maximale que les actuels conteneurs de 12,19 mètres (soit 30,48 tonnes) et qui présenterait des points de levage compatibles avec les dispositifs de levage actuellement en usage, l'industrie canadienne du transport aurait alors peu de difficulté à s'adapter au changement. Si l'augmentation de la capacité des conteneurs avait pour effet de réduire les coûts du transport, comme cela s'est produit aux États-Unis, les expéditeurs et les consommateurs canadiens en bénéficieraient à long terme.

La normalisation d'une nouvelle classe de gros conteneurs obligera les exploitants de terminaux à conteneurs, les compagnies ferroviaires et les entreprises de camionnage à faire certains ajustements: modification des palonniers de manutention, achat des nouveaux matériels de manutention verticale, achat de nouveaux châssis porte-conteneurs, modification de la disposition des aires de stationnement des conteneurs. La productivité des terminaux risque même de baisser, avec l'augmentation du nombre de modèles de conteneurs normalisés. Mais aucune des personnes interviewées aux fins de la présente étude n'a pu identifier d'obstacle insurmontable interdisant l'adoption d'une nouvelle classe de gros conteneurs. En fait, les compagnies ferroviaires ont déjà commencé à s'équiper pour pouvoir manutentionner et transporter tous les nouveaux modèles de conteneurs considérés par l'ISO.

On entrevoit bien un problème touchant la réglementation routière, la longueur limite autorisée pour les semi-remorques étant de 14,65 mètres dans certaines provinces. Il semble toutefois que l'une ou l'autre des trois solutions suivantes permettrait la circulation des nouveaux conteneurs de 14,63 à 14,94 mètres dans la plupart, sinon dans toutes les provinces et territoires du Canada. Il suffirait:

- (i) d'adopter une limite de 16,2 mètres;
- (ii) de permettre la circulation de ces grands conteneurs par permis spécial;
- (iii) de permettre le transport de ces grands conteneurs sur châssis de 14,63 mètres, puisque la réglementation en vigueur tolère un certain porte-à-faux.

Si toutefois l'industrie sollicitait l'aide du gouvernement, celle-ci devrait se limiter à appuyer les normes qui, de l'avis des experts, seraient les plus propices à la réalisation des objectifs visés, c'est-à-dire une norme:

- (i) qui s'écarte le moins possible de la réglementation concernant les dimensions limites et la masse maximale des véhicules routiers;
- (ii) qui tienne compte des dimensions des unités de charge et des palettes les plus courantes;
- (iii) qui permette de mettre au point un modèle demi-conteneur dont les dimensions seraient également compatibles avec les unités de charge et les palettes les plus courantes;
- (iv) qui permette d'acheminer le trafic de marchandises de faible densité de façon plus efficace que ne le permettent les conteneurs ISO actuels.

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1. INTRODUCTION

This report was commissioned by the Transportation Development Centre. From the Terms of Reference, "the purpose is to provide the basis for arriving at a Canadian position on the question of new International Standards Organization (ISO) container standards and to suggest the steps that might be necessary or desirable in the event that a particular decision is adopted by the ISO."

The findings are based on interviews with people involved with container movements — Port officials, terminal operators, railways, truckers, and others. In addition, the available data has been assembled and analyzed. A list of those consulted is contained in Appendix A; the data is contained in Appendix B.

Section 2 describes the background that gave rise to this study. Section 3 analyzes the data, and Section 4 outlines the position or interests of non-Canadian groups. Sections 5 to 8 examine the potential impact on different sectors of the transportation industry: ports, railways, truckers, and highways. Ocean carriers are not included. Finally, the last two sections, Sections 9 and 10 analyze the market for larger containers and their impact in greater detail.

This report uses both Imperial and metric measurements as the transportation industry universally refers to containers and container chassis in Imperial measurements (e.g. a 40 foot box as opposed to a 12.19 m box)

2. BACKGROUND

2.1 International Standards Organization

The current ISO standards, which have been developing since the first 20/40 foot ISO standards were established in 1964, have set, among other things, the following dimensions and weights for the two most common general freight containers:

- 20-foot length, 8-foot width, up to 8' 6" in height, and up to 24 tonnes (52,920 lbs) in gross weight. Until a few years ago, the maximum weight of these containers was 20.32 tonnes (44,800 lbs) and there are still many 20-foot boxes in use which are only rated to this weight.
- 40-foot length, 8-foot width, up to 9' 6" in height, and up to 30.48 tonnes (67,200 lbs) in gross weight.

ISO standards are voluntary; anybody is free to use different dimensions and/or weights. For example, 9' 6" high containers have been around for a number of years even though they only became an ISO standard in June of 1989. The use of non-standard containers — particularly the longer 45-foot, 48-foot, and even 53-foot containers (United States), and the wider 2.5 metre (Europe) or 102 inch (North America) containers — is the reason why there is pressure on the ISO to adopt new standards for larger containers. Some observers have suggested that, unless there is an agreement on standards, there will be a proliferation of different sizes leading to the problem of extra handling costs and (even) a degrading of the world's container-handling system.

At a meeting of the ISO technical committee on Freight Container Standards in Ottawa in June 1987, a working group was set up to review proposals for larger containers. It was anticipated that a meeting of the committee in London, England in June 1989 would decide on the working group's recommendations. However, no agreement was reached as there are strongly held differences of opinion as to the need for new containers and, given a need, as to the most desirable dimensions. Instead of a decision, the whole matter was referred to the United Nations Economic and Social Council so that the economic implications of larger containers could be studied.¹

The Canadian position at London was in support of a length of (about) 14.8 metres (48' 6-7/8"), with no increase in weight over the 30.48 tonne limit for the current 40-foot containers. Since the June meeting, the working group has continued to meet in order to develop technical data for the UN economic studies. The latest such meeting was in Hamburg in October 1989 where one of the documents considered showed future containers with widths of 2.6 m (102.362") and nominal lengths of 24-feet (7.3 m), 40-feet (12.2 m), and 48.5-feet (14.8 m). Other positions were

¹ As a result, the Inland Transport Committee of the UN's Economic Commission for Europe held a seminar in Geneva from Nov. 13-16, 1989. The 3-page press release suggests: "The Seminar stressed however that any decision on future dimensions of loading units of combined transport to be carried on roads must await the results of thorough cost-benefit analyses, also taking into full account road traffic safety and environmental considerations."

examined including one for 49-foot containers with an actual length of anywhere from 14.9 to 15.1 metres.²

This working group will continue to meet and debate the issues. While it is too early to know what the final recommendations will be, speculations centre on the following:

- (a) there is little likelihood of any increase in weights (the pressure for increased weights is in respect of the 20-foot containers);
- (b) if there is to be an increase in widths, the choices seem to be between the European standard of 2.5 m (98.4"), and the North American 102" (or 2.6 m which is slightly larger); and
- (c) the decision on length tends to focus on measurements of anywhere from 48 to 49 feet (14.63 to 14.93 m) with a companion "half-length" container also being considered.

The next Plenary meeting of the ISO is scheduled for Seoul, South Korea in June 1991; this is the earliest that a decision could be made.

2.2 The Debate Over Container Length

The most contentious item in developing standards for future containers is the debate over length. It revolves around the following issues:

- First, there is the constraint of the over-the-road length limit for trailers in various countries. This varies from 40 feet (the practical limit in some European countries), to 45 feet (which is now possible on trucks meeting new EEC regulations), to 48 feet (the minimum North American standard) to 53 or more feet (an increasing number of North American jurisdictions).
- Second, there is a desire to make the length optimal having consideration to pallet sizes and unit load sizes. In order to preserve complete modularity, the experts on the ISO committees also argue that the new container should have a half-length companion which also should be optimum in terms of its ability to carry the standard unit loads and/or pallets.
- Third, there is the constraint created by the existing and planned investment in equipment designed to handle current ISO containers. There is a massive investment in ships, terminals, and handling equipment for the current 20 and 40-foot ISO containers. Some people argue the development of a new standard will make these facilities redundant — that is, be retired before the end of either their financial (depreciation or tax) or physical lives.

² M. Yannick Guillemot of France points out that the advantage of 49' (14.935 m) is that its half-size is better at handling standard unit loads than the comparable half-size to the slightly smaller 48' (14.63 m) or 48' 6.5" (14.805 m) container. Actual descriptions of the 49' container sometimes show it as long as 15.05 m or 49' 4.5".

This study does not resolve these issues. Rather, it simply recognizes that they exist and that they are important in determining the eventual outcome of the debate on standards.

2.3 North American Developments

Over-the-road limits have been the prime constraint in the development of container standards: road limits in most countries are more restrictive than those imposed by rail or marine transportation. Hence, the change in regulations governing truck sizes in North America have been one of, if not the main driving force behind the push for larger containers. In both Canada and the United States, regulations governing truck sizes have changed since the first ISO standards were developed such that 48-foot long and 102-inch wide trailers have become the standard for general freight equipment. Even these dimensions may soon be replaced.

In the United States, the most significant change occurred with the federal Surface Transportation Assistance Act in 1982. Among other things, it mandated a width of 102 inches and a minimum semitrailer length of 48 feet on interstate highways. In Canada, most provinces had adopted 102 inch widths by 1970 and during the following decade most adopted the 48-foot semitrailer length as well.³

The 48-foot length limit is, in turn, being replaced by even longer lengths. There are now 37 states which allow 53 feet and 14 where 57 feet is legal.⁴ In Canada, a major study on the technical basis for truck weight and dimension regulations in 1986 supported a length limit of 53-foot for semitrailers.⁵ For a number of reasons, however, the actual Memorandum of Understanding signed by the provinces and territories on February 12, 1988 committed the provinces to adopting a length limit of only 14.65 metres (48') — the effective pre-1988 limit in most places. Western Canada has since adopted a 53-foot limit for semitrailers and there are indications the territories and Ontario will follow the Western provinces' lead.

Current length limits in Canada are described in Section 8 below. For here, the point is that it was this move to 102 inches or, in the case of Canada, 2.6 metres (102.4") for widths and to 48 feet or longer for lengths that opened the door for the appearance of containers longer and wider than ISO standards. The process is described in Section 9 below.

³ Alberta was the first jurisdiction in the world to adopt the 102" standard, according to sources interviewed. It did so because of the difficulty of loading two 48" pallets in an 8' wide trailer.

⁴ The numbers used in the text are as of the spring of 1989 and are as reported by C.D. Willmott in *Traffic World*, June 12, 1989. He notes there are only 11 states which do not permit or have plans to permit 53' semitrailers. Sometimes there are restrictions as to the roads within a state where these semitrailers may operate.

⁵ RTAC, Vehicle Weights and Dimensions Study Implementation Planning Subcommittee, *Recommended Regulatory Principles for Interprovincial Heavy Vehicle Weights and Dimensions*, September, 1987.

3. CONTAINER MOVEMENTS IN CANADA

There were 13.6 million tonnes of containerized freight, of which 12.6 million were international, handled at Canadian ports in 1988. This represented about 1.3 million TEUs (20-foot equivalent containers). Port statistics, though, do not account for all container activity. The railways handled 926 thousand TEUs in 1988 and a further 341 thousand trailers, some of which carried domestic containers. The trucking industry also handles most containers in Canada at some stage of their trip. Sometimes this may only be a few miles of urban roads as a truck picks up or delivers a container to a maritime terminal or a rail intermodal yard. At other times, it may involve hauls between Vancouver and Seattle/Tacoma or even, on occasion, from Vancouver to Central Canada. There is no data on the number of containers handled by truckers; at best, an unreliable estimate is that in 1987 for-hire truckers handled about 0.6 million containers on both domestic and international routes (Appendix B). A significant number of these were the return of an empty container to a terminal.

There is no data that can sort out all these container movements (ports, rail, truck) and, in particular, the overlapping or omitted portions. With this limitation, the following are observations pertinent here:

- **Containerization and total freight activity:** The 12.2 million tonnes of containerized freight handled at Canadian ports in 1987 is modest in comparison to the total 362.2 million tonnes. But this comparison hides the value of both the commodities handled by the containers and the value of the service provided. In some ports, such as Montreal, containerized freight accounts for as much as 25 percent of total activity as measured by tonnes. In terms of the railways, containers, along with piggyback trailers, account for between 10 and 15 percent of total revenues.
- **Growth of containerization:** International containerized freight has increased by 66% in the last five years (1982 - 1987), and domestic containerized freight, handled by the ports, has increased by 123% over the last four years. The average annual rate of increase in tonnages over the last five years for containerized international freight has been 13.5% for inbound movements and 8.6% for outbound movements.
- **Competition with US ports:** Marine container routings ignore the border between Canada and the United States as shown by the substantial volume of transborder container flows. Containers with an origin or destination in one country cross the border to use a port in the other country. On the east coast, roughly half the volume of containers through Montreal is US mid-west traffic. On the west coast, many containers with an origin in or a destination from Canada are using American ports. The annual volume of these flows is in the range of 400,000 TEUs: the latest data for the last quarter of 1988 shows 98,999 transborder TEU movements and the data for the first quarter of 1989 shows

101,808. Since about 1982, Canada has had a slight lead in terms of the total number of containers handled for the neighboring country.⁶

- **A global perspective:** In 1988 there were 73 million TEU movements worldwide. Some ports accounted for as many as four million (Hong Kong), and ports in the United States accounted for as many as two million (New York/New Jersey) and one million (Seattle, with Portland and Tacoma adding almost another million).⁷ Canada's ports handled 1.3 million TEUs in 1988, with another 0.1 to 0.2 million domestic TEUs moved by the railways.⁸ From a narrower, North American perspective, total international tonnes of containerized cargo in Canada of 12.6 million tonnes was only 17.5 percent of the 72.0 million tonnes in the United States.⁹ The point of either of these perspectives is this: it would be difficult for Canada to adopt container standards different than those used in other parts of the world, particularly those used in the United States.

⁶ Data is from Revenue Canada, Customs & Excise. In 1988 there were 85,295 more American TEUs handled at Canadian ports than there were Canadian TEUs handled at American ports. The imbalance in the number of US containers moving through Canadian ports versus Canadian containers moving through US ports may be disappearing: in the first quarter of 1989 Canada handled 11,452 more US TEUs than the number of Canadian TEUs handled by US ports; this compares with 29,632 in the same quarter of 1988.

⁷ *Containerization International*, July 1989, p 43.

⁸ The estimate of domestic TEU is rough: CP Rail has 2,000 domestic containers (44'3") which average about 2 trips/month or, roughly, 100,000 TEU per year; CN Rail has 1,600 domestic containers, mainly on the service to Newfoundland, which may add another 100,000 TEU.

⁹ Information is from "Economic Impact of Large Maritime Containers on the United States Domestic Transportation System," presented at the seminar of the Inland Transport Committee of the UN's Economic Commission for Europe held from Nov. 13-16, 1989 in Geneva. Hereafter, this reference is referred to as "US DoT, Nov 1989"

Table 1: Summary of Containerized Freight Movements in Canada**Container Traffic at Canadian Ports**

TOTAL (a)	Domestic Tonnes 10 ³	International Tonnes 10 ³	Total Tonnes 10 ³
1985	652.9	9,093.2	9,746.1
1986	1,510.0	9,799.3	11,309.3
1987	1,431.1	10,847.3	12,278.4
1988 (preliminary)	984.9	12,592.9	13,577.8

THREE LARGEST PORTS (b)

	Vancouver		Montreal		Halifax		TOTAL	
	tonnes 10 ⁶	TEUs 10 ³	tonnes 10 ⁶	TEUs 10 ³	tonnes 10 ⁶	TEUs 10 ³	tonnes 10 ⁶	TEUs 10 ³
1985	1.61	178.2	4.42	481.5	1.95	263.1	7.99	922.8
1986	2.00	222.8	4.94	531.5	2.26	270.8	9.21	1,025.1
1987	2.41	280.8	5.53	574.5	2.79	331.8	10.73	1,187.1
1988	2.73	305.7	5.73	560.4	3.54	412.2	12.00	1,278.3
average annual growth rates	19.3%	19.7%	9.0%	5.2%	21.9%	16.1%	14.5%	11.5%

Inland Container Traffic

RAIL (c)		CN Rail	CP Rail	Total
1987	TEUs	360,000	395,000	755,000
	trailers	250,000	120,000	370,000
1988	TEUs	480,000	446,000	926,000
	trailers	225,000	116,000	341,000
TRUCK (d)				
1987	Total for-hire shipments			33.7 million
	containers movements (crude estimate)			0.6 million

(a) StatsCan data (1988 by telephone)

(b) Data supplied by individual Ports

(c) Data supplied by CN and CP Rail¹⁰

(d) StatsCan data; see Section B.7 for details

¹⁰ Data for 1987 is from F. E. Phillips "Canadian Rails Handle Deregulation With Care," *Containerization International*, May 1988. It has been confirmed by CN and CP Rail. Data for 1988 was supplied by the railways. It is possible that the 1987 and 1988 figures for CN Rail are not strictly comparable: the issue is whether the 1987 figures are just international TEUs or whether, as with the 1988 figures, they include domestic TEUs. In the case of CP Rail, domestic container movements are included with "trailers."

4. AMERICAN, EUROPEAN, AND THIRD WORLD INTERESTS

4.1 Introduction

Canada cannot operate a container system in isolation from other countries, nor can it adopt a position on future standards without taking account of interests in other parts of the world. This section examines developments in other regions — the two most important being the United States which, to some extent encompasses the Pacific rim countries, and Europe.

4.2 United States

The US Department of Transportation has no official position on future container sizes. It is, however, "watching the process" and "has a concern that, whatever standards are adopted, American interests not be put at a competitive disadvantage." It is not known what this concern with competitive advantages/disadvantages means in terms of actual container dimensions. As in Canada, standards are a matter of agreement among industry officials and, as in Canada, the US representatives at the ISO include people from various shipping and other groups.¹¹

There have been suggestions that Americans are committed to a new 102-inch by 48-foot standard because of the recent large investment in such boxes for domestic freight.¹² But other sources dispute this — or, at least, say that those who once appeared committed to 48 feet are now, after the latest ISO meeting in Hamburg, more flexible. Other US groups — those involved with ISO technical committees on material handling — favour a length of about 14.8 metres; they see this as optimal given unit load and pallet dimensions.¹³ It is also understood that the American position at the most recent working group meeting in Hamburg was for a 49-foot (14.9 m) length. Finally, note should be made of the most recent proposal for a US standard for domestic containers: 2.6 metres (102.4") in width; 2.9 metres in height (9' 6.2"); lengths of 45 feet, 48 feet, and 53 feet; and, intermediate handling apertures at 40 feet.¹⁴ It is probably fair to conclude, then, that as in Canada, there is a debate about the issue of future container sizes and that there are a number of diverse points of view.

¹¹ The ISO member body for the US, for TC 104, is the American National Standards Institute (ANSI). Ms Nancy McCrae, from the US DoT, who attends as an observer, provided some of the information used in this section. The US ISO representatives include officials from APL and Sea-Land. In addition, the chairman of the TC 104 working group (WG 4) is from Sea-Train.

¹² *Container Management*, May 1989, reports that the TC 104/WG4 meeting in San Francisco "US participants favoured the adoption of an immediate standard with a length of 48ft . . ."

¹³ Russ Hastings, Chairman of the USA Technical Advisory Group to ANSI for ISO/TC 122 wrote a memo dated September 19, 1989 in which he advocated the "American Plan" (as contrasted with the "French Plan"). Among other things, this "American Plan" sets out container lengths of 14.8 m and (half lengths) of either 7.36 m or 7.48 m.

¹⁴ The information is from "Evolution of dimension of loading units and its consequences on combined transport: Trends in container transport," US Government, at the Inland Transport Committee Working Party on Combined Transport, May 29 - June 1, 1989. The domestic container standards are proposals by ANSI.

Positions or various interests aside, an official from the US Department of Transport gave the following figures on the total inventory of US containers in 1989:

20-foot	863,782	56.00% of total
24-foot	11,309	0.73% of total
35-foot	4,719	0.31% of total
40-foot	128,915	41.53% of total
45-foot	16,401	1.07% of total
48-foot	4,557	0.31% of total
53-foot	600	0.04% of total

It is only the 48 and 53-foot containers listed above that exceed, at 102 inches, the ISO 8-foot width standard. It is clear that in the United States — where many of the pressures for changes in container sizes have occurred — there is a tremendous investment in the standard 20 and 40-foot boxes (97.5% of the total). But, as noted by the presenter of the above figures, whatever the current investment in 20 and 40-foot boxes "the relative share of the largest boxes has grown and will continue to increase . . . possibly requiring future changes to the United States domestic transportation infrastructure."¹⁵ In fact, in an article in *Container Management* in May 1989, it is noted that there are now over 30,000 45-foot containers in service in the United States, primarily on the Pacific trade. According to an article in the June 1989 issue of *Containerization International*, there "may already be" over 10,000 48-foot containers in the United States. Whether these figures (30,000 and 10,000) represent an increase over the ones shown above or ownership by other nationalities is not known. Whatever the case, the evidence indicates a rapid growth in boxes larger than the current ISO containers.

4.3 Europe

"Inland, in Europe at least, tunnel clearances, railway loading gauge restrictions and specific road vehicle regulations would . . . appear to form an important obstacle to widespread acceptance of larger dimensions as a formal standard."¹⁶ As the most limiting factor in container weights and dimensions is generally regulations covering over-the-road movements, the following summarizes aspects of these limits in Europe. There are two sets of regulations: those covering domestic trucks (trucks operating within the borders of a particular country); and, those established by directives from the European Community (EC) for trucks operating internationally between member countries.¹⁷

- Width: EC regulation on widths, and the regulations of most countries, permit 2.5 metres (98.4"). Only Sweden, Finland, Belgium

¹⁵ This information, including the numbers on the container inventory, is from US DoT, Nov 1989.

¹⁶ *Container Management*, May 1989, p 33.

¹⁷ A. Clayton, and M. Johansson, *Weight and Dimension Regulations Governing International Trucking in the Nordic Regions*, report 1988:6E, Swedish Transport Research Commission, Stockholm, June 1988; and A. Clayton, "Developments in Weight and Dimension Regulations Governing International Trucking in the Nordic Region," working paper, Swedish Transport Research Commission, September, 1988. The regulations were in effect as of the winter of 1987/88. The two EC directives are EC 85/3 and EC 86/360. At the time these reports were written the "reefer width exception" (ie, to operate at a width of 2.6 m) was under consideration by the EC. There is some indication that this has now been adopted.

and the Netherlands allow widths of 2.6 metres; Denmark allows 2.55 metres.

- **Exceptions to Width Limit:** France (2.55 m), Great Britain (2.58 m), Italy (2.6 m) and Norway (2.6 m) permit wider bodies for refrigerated vans or trailers. Further, German and EC regulations themselves may soon also grant this exception (in fact, may already do so, given that the information discussed here is as of 1988). These exceptions to the width limits may be important: they suggest that the road geometry can handle widths of up to 2.6 metres.
- **Length Limits:** There is considerable diversity in the way length limits are specified. The most common limit, and also the EC limit, for full-trailers is 12 metres (just under the 40-foot length of an ISO container); the most common limit for semitrailers is no limit — the effective limit being the control on combination lengths; and, the most common limit for tractor-semitrailers has been 15.5 metres which, from a practical perspective, allows semitrailers with a length of 12.0 to about 13.0 metres (or a bit longer, depending on the length of the tractor). These are just long enough to handle the 40-foot ISO container. In June, 1989, however, the EC adopted a new standard of 16.5 metres for tractor-semitrailers and 13.6 metres for semitrailers. This will permit the handling of 45-foot containers.
- **Axle Loads:** Single-axle load limits vary from 10 tonnes (the same as the RTAC standard) to a high of 13 tonnes in Spain and France. The EC regulations will permit, by 1991, a load of 11.5 tonnes on single drive axles and 10.0 tonnes on other single axles. Tandem-axle load limits also tend to be higher than Canadian limits: most countries, with the exception of the Nordic ones, allow up to 20 to 21 tonnes on a tandem (given appropriate spreads), versus the 17.0 tonne RTAC standard; and, the EC limit for international trucks is 18.0 tonnes for spreads of 1.3 to 1.79 metres (the typical range of spreads in Canada) and 20.0 tonnes for spreads of 1.8 metres or more.
- **Gross Vehicle Weight:** Allowable GVWs range from about 38 tonnes (UK) to 51.4 tonnes (Sweden). The EC limits are 40.0 tonnes, except that 5 and 6-axle tractor semitrailers hauling 40-foot ISO containers are allowed 44.0 tonnes.

In addition to the EC directives covering interjurisdictional trucks, there are other efforts being made to harmonize national standards. The task of establishing technical specifications is given to CEN (Comite Europeen de Normalisation). While CEN is developing standards for swap bodies, it has no current plans to develop standards for marine containers. It has been suggested, though, that swap body standards — particularly a width of 2.5 metres — will have an important influence on the European position on future container standards.

There are other European developments important in considering future containers: increasingly, Europeans are using a container with a width of 2.5 metres (lengths in most cases remain the same

as the 20 and 40-foot ISO container)¹⁸; the new tunnel between England and France is being built to accommodate containers with a width of 2.6 metres and a height of 2.9 metres; and, there have been moves in Europe to increase the weight of the 20-foot container to 30 tonnes (versus the current 24 t). This last proposal — the 30 tonne 20-foot container — has a good chance of being adopted in 1991.

To summarize, there are obstacles to the widespread acceptance of the larger North America containers and to some of the dimensions being considered by the ISO. Four observations may be made on European interests: first, as in Canada or the United States, there is no uniform position on the issue of future container sizes; second, while there are aspects of European truck weight and dimension regulations making it difficult for most countries to accept boxes longer than the current ISO 40 feet or a new 45 feet, there are, nevertheless, some Europeans who advocate a new standard in the range of 14.8 to 14.9 metres¹⁹; third, the existence of the 2.5 metre width limit in many countries and the development of a European container with a width of 2.5 metres makes the acceptance of the North American 2.6 metres difficult (not impossible, as the exception for refrigerated equipment shows); and fourth, the high axle loads allowed in Europe are a factor favoring an increase in the allowed maximum loads for the 20-foot containers.

4.4 Other Countries

Countries other than those in Europe and the United States are understood to be generally against any changes in container sizes.²⁰ This is because, particularly in the developing countries, there is a severe shortage of container-handling equipment. The development of new container sizes would only exacerbate the problem given the difficulty these countries have in obtaining investment funds.

¹⁸ *Container Management*, May 1988, reports, "it is evident that the 2.5m width is becoming the standard" The article notes that even the ships used between Ireland, the UK, and the continent have converted or are converting to the 2.5 m standard.

¹⁹ This observation is on comments made by Yannick Guillemot of France. In a presentation dated July 12, 1988, he notes that "some European experts" were supporting new container sizes of 12.497 m (41') and the half-size 6.223 m (20' 5") because these "are immediately compatible with the present European road regulations." However, he goes on to note that because these sizes are so close to current ISO boxes, "the majority of experts has therefore recognized . . . 14.935 m (49') and 7.442 m (24' 5") . . . as being the best answer for . . . optimization."

²⁰ See, for example, *Container Management*, May 1989 or the article by G.W. Wood "Optimization of Traffic Management and Transit Traffic" as the Workshop on Railway Development in Sub Saharan Africa, November, 1988.

5. POTENTIAL IMPACTS - PORTS

For this research, port authorities and individual terminal operators were contacted in the three main container ports in Canada. While these interviews were brief and while there is no pretense of being able to fully represent the views and/or interests of this group, there was a common theme that emerged from the discussions.

First, though, a qualification: with one minor exception, no terminal has had any experience handling containers larger than the ISO 40-foot. (This ignores the inland rail terminals handling such things as CP Rail's domestic containers.) This means that many of the opinions expressed were based on speculations rather than the actual experience of handling larger, or non-ISO containers.

The one exception involved instances of where ships came into port with 45-foot boxes piled on top of ISO containers. The terminal involved had to move these in order to handle the 20- and 40-foot boxes underneath. This at least gave them the experience of knowing how the spreaders — the mechanism that fits on the top of the container for lifting — work on containers larger than 40-feet. No problems were encountered although the cranes do not work quite as fast as the "flippers" used to guide the spreaders on 20 and 40-foot boxes cannot be used.

The most common theme emerging from the interviews is that the ports and, more specifically, the terminals exist to serve the needs of their customers. In the words of one of those interviewed, "If one of our customers told us they we're going to start handling larger containers tomorrow, I'd have the modifications made tonight to handle those containers on the next ship." The second most common theme to emerge was the view that the prospects of larger containers showing up at the terminal under question were very low if not nil, and that, in any case, there was no necessity for larger containers. This second point was a reflection on the type of commodities being handled by Canadian terminals in comparison to American terminals (denser); it was mainly expressed by terminal operators in Montreal and Halifax.

In a worst case scenario, the introduction of new container standards would require the replacement of every spreader at every terminal in the country (about 100 times \$150,000 for a total of \$15 million), the replacement of every chassis used to move the containers (several hundred times \$10,000 - \$15,000 each), and the complete rearrangement of the layout of every yard (wider containers would require different aisles and different layouts for the straddle cranes). But this worst case scenario is not likely to happen. First, the future containers will almost certainly retain the lifting points now on ISO containers (just as CP Rail's new 48-foot containers do and just as the proposed standards for US domestic containers suggest) meaning that with some adjustments and perhaps some inconvenience the existing equipment can be used to handle larger containers. (There is, apparently, a long-term goal to have ISO lifting points moved to the extremities of the new containers, but this is not going to happen in the near future.) Second, given the investment in existing ships and 20 and 40-foot ISO boxes, there is no possibility that the switch to larger containers will occur at such a pace so as to require the complete re-design and re-equipping of a terminal.

A more likely scenario is that, as and when the introduction of larger containers appears imminent, terminals will gradually replace their existing equipment with larger spreaders and longer container chassis, both of which are already on the market. In fact, this "gradual" approach has been a

characteristic of the introduction of the new 45-foot containers.²¹ It is true that there will be a necessity to mark off some part of the terminal for the storage and handling of these new containers — the new widths cannot be mixed with the old ISO boxes — and it is also true that the introduction of a new size may impair the productivity of the terminals — handling more sizes with cranes and lifting equipment possibly operating at slower speeds slows things down. But these disadvantages would be not different than those faced by any other terminal in North America. The one potentially troublesome factor is that smaller terminals (meaning Canadian) are not as capable of spreading the costs of new investment over large volumes of containers. This is just one more aspect of the economies of scale inherent to containerization.

To summarize, aside from some matters of adjustment, no one interviewed during the course of this research could identify any insurmountable, or even really difficult problems that a Canadian terminal would face if a new ISO standard were adopted.

²¹ *Container Management*, August, 1989.

6. POTENTIAL IMPACTS - RAILWAYS

Both CN and CP Rail have large intermodal operations as the following figures for 1988 show:²²

	CN Rail	CP Rail	Total
Volumes			
TEUs	480,000	446,000	926,000
trailers	225,000	116,000	341,000
Equipment			
railcars	4,090	3,700	7,790 ²³
trailers	3,517	1,200	4,717
containers	1,600	2,100	3,700

The constantly changing regulations governing truck weight and dimension regulations, and now the possible changing standards for containers, create problems for the railways. The most serious one is that railcars are made obsolete before being fully depreciated. This has influenced both company's choices for new intermodal equipment as the cars selected are quite flexible in terms of the box sizes that can be handled.

- **CN Rail:** Of the current fleet of 4,090 cars, 270 of those used for piggyback service could be used to handle trailers of up to 53 feet in length (and, obviously, containers on chassis of this length), and 400 of the cars used for containers could be used to handle containers of lengths in the range of 48 to 49 feet. Other equipment could also be used to handle longer trailers and/or containers, but not as efficiently. The most recent equipment, which is just being acquired now, is 100 new 5-paks (i.e., five platforms more-or-less permanently attached). The 500 platforms ("wells") on these cars have a length of 49' 3" and, in double-stack use, could carry containers of up to 57 feet in the upper position (although no one is actually anticipating such a container). CN plans to introduce its own domestic container service with boxes probably having dimensions of 2.6 by 2.9 by 14.6 metres — slightly wider than 102" and slightly higher than 9.5' and about 48' in length, although the final decision on length may be left open until after an ISO decision is known.
- **CP Rail:** CP Rail developed its own domestic container service in 1979 using containers with a length of 44' 3" and a width of 102

²² Data is from the railways, Appendix B, and the following: (i) R.H. Foot and T.W. Phillips (both of CP Rail) "Intermodal Transportation and the Vehicle," *Proceedings*, Second International Symposium on Heavy Vehicle Weights and Dimensions, Kelowna, June 1989; (ii) A.W. Gibson, (of CN Rail) "Highway/Rail Compatibility Issues: Intermodal Strategy and Operations in a Changing Environment," *Proceedings*, Second International Symposium on Heavy Vehicle Weights and Dimensions, Kelowna, June 1989.

²³ In the case of CN Rail and possibly also CP Rail, a "car" for this count means a "platform."

inches. These were optimal for the rail cars then in use and for the regulations then governing over-the-road movements. Recently, CP Rail has made the decision to commence a 48-foot domestic container service: they now have 100 such containers and are in the process of acquiring a further 50. All of these containers retain the ISO lifting points. As a consequence, as long as any new ISO containers also retain the existing lifting points, most of CP Rail's lifting equipment is capable of handling it: 37 of their 46 lifting machines can handle containers longer than 40 feet. Some of the older flatcars could handle new, longer containers, although the expectations are that it would be the new spine cars (five platforms joined as one car) that would be used. These can handle containers with a length of 14.8 metres (48' 6-7/8") and even containers of up to 49 feet, although they would have to alternate with shorter containers.

It is evident, then, that while the railways would have to make some adjustments to handle larger international containers, there are no major barriers standing in the way to their introduction.

7. POTENTIAL IMPACTS - TRUCKERS

Trucks can handle any container being contemplated by the ISO or others. Chassis capable of handling any of these containers are available on the market at a cost of \$10,000 to \$20,000. Some of the chassis can even accommodate a variety of lengths and/or widths.²⁴ Other than truck weight and dimension regulations, which are considered in the next section, there are no significant impacts on the trucking industry if larger container standards are adopted.

²⁴ *Containerization International*, June 1989, p 36, gives the price of a container chassis at US \$7,000. J.R.C. Boyes, writing in the May 1989 issue of *Containerization International*, gives the following prices (in US dollars): a rigid 23' chassis (the most common type for 20' containers up until a few years ago) at \$6,000; a tri-axle chassis that extends from 20 to 40 feet at \$15,000 (this is probably the newest and most expensive container chassis). In the text, the figures of \$10,000 to \$20,000 are used to account both for the value of the Canadian dollar and sales taxes.

8. POTENTIAL IMPACTS - HIGHWAYS

ISO containers can be handled by trucks meeting RTAC weight and dimension regulations as long as the correct equipment is used and as long as the container is placed correctly on the trailer. These two qualifications concerning equipment and placement are important. In terms of weight, the following are representative of typical tractor and trailer tare weights and maximum ISO container weights. The difference between the two 40-foot chassis shown is one axle (i.e., a 5-axle versus a 6-axle tractor-semitrailer):²⁵

	20-foot container	40-foot container
tractor-trailer tare weight (kg)	11,492	11,790 - 12,998
ISO container, maximum (kg)	<u>24,000</u>	<u>30,480 - 30,480</u>
	35,492	42,270 - 43,478
RTAC tractor-semitrailer maximum GVW (kg) - 5-axle	39,500	
- 6-axle		46,500

This is not to suggest that hauling containers is without problems. First, hauling two heavy 20-foot containers is difficult under RTAC regulations. This is not relevant here, however, as the issue is new standards for large containers at the existing 40-foot ISO weights.²⁶ Second, even considering one heavy 20-foot container, it is possible to place such a container on some equipment in such a manner so as to overload an axle group and yet stay within the overall RTAC GVW limit. Again, this is not relevant here. Third, there is an apparent problem with overloaded containers. During the course of the research, allegations were made that overloading is widespread. The only data that could be found on this issue (Section B.6 in the appendix) does not support this contention: few 20-foot or 40-foot containers exceed the ISO limits. US overloads

²⁵ Chassis weights used in this analysis are 6,840 lbs (3102 kg) for a 23' chassis; from 7,500 to 9,900 lbs (3401 - 4490 kg) for a tandem-axle 40' chassis (the heavy chassis is, according to the source, an "old" model); and 10,160 lbs (4608 kg) for a new tri-axle 40' chassis. Tractors are assumed to be typical Canadian tractors at 18,500 lbs (8390 kg); there is a lot of variability out on the road. An A- or C-dolly is assumed to weigh 2,000 lbs (907 kg).

²⁶ Two of the heaviest 20' containers weigh 48 t (105,840 lbs) which exceeds the capacity of any RTAC configuration and, even, most Ontario configurations given practical front-axle loads. (Ontario regulations, compared to local regulations in other provinces or territories, have the highest practical payload capacities for containers.) The proposed 30 t 20' container, which may become a standard in 1991, could be handled by the RTAC regulations with a tri-axle chassis having a length of 33 feet. The container, however, has to be placed in the centre of the chassis to achieve the proper load distribution. The RTAC A-train is not feasible for containers because of the 16 t cap on the rear pup: the practical maximum payload is about 12 t and there are few 20' containers as light as this in Canada. The RTAC C-train, at the proposed 58.5 t, can handle two 20' containers with a combined weight of 43 t (94,800 lbs). The RTAC B-train, depending on the specifications, has a payload capability of between 41 - 46 t. The problem with it, however, is the difficulty of unloading a container on the lead pup: although there are methods to "solve" this, most of the B-train lead pups cannot be backed up to a dock because of the fifth wheel.

are discussed in Appendix B; "overloading" is within the context of the US federal bridge formula which is not relevant to a consideration of overloading in Canada.

Fourth, another difficulty is with RTAC inter-axle spacing requirements. Trailers used to handle 20-foot containers are typically in the range of 23 to 27-feet in length. With the shortest of these, there is about 3.35 metres between the last axle of the tractor and the first axle of the semitrailer. RTAC requirements are that there be 5.0 metres between the two sets of tandems. There is no comparable problem with the 40-foot containers in that the chassis used to haul these typically would have more than the 5.5 metres required under the RTAC regulations between the two sets of axle groups (5.0 m is required between two tandem-axle groups, 5.5 m is required between a tandem and a tridem axle group).

There is one other point to note about future containers and truck weight and dimension regulations — the dimensional aspects, in particular, the length of the new containers. When this study was initiated, it was anticipated that there might be a problem in Eastern Canada if a new standard exceeding 48 feet (14.63 m) were adopted. As described in Section #2.3, after the completion of the RTAC study on weight and dimension regulations, the country more-or-less divided in two in terms of allowable semitrailer lengths: 16.2 metres (53') in Western Canada, and 14.65 metres (48') in Eastern Canada (ignoring a special case in Quebec).

However, considering the legality of future containers is not as simple as considering just length limits. There are several methods whereby a container longer than 48 feet can be accommodated when the legal semitrailer length is only 14.65 metres: special permitting, that is, obtaining a permit that allows a truck to operate at something other than the standard regulations; and overhanging, that is, a provision in the regulations allowing a load to overhang the trailer. Table 2 shows the situation in all twelve jurisdictions as of November, 1989, taking into account pending changes in the regulations and some situations where provinces — in their reply to a survey for this study — suggest that a decision on acceptable lengths may be made in the future.

In terms of future containers, then, there does not appear to be a major problem with either the anticipated maximum weights (30.48 t) or any of the lengths so far discussed (48' - 49').

In addition to the relationship between containers and truck weight and dimension regulations, there are several other areas where containers may have an impact on highways: safety, highway capacity, and possibly such things as splash and spray. These are, to some extent, inter-related. First, as far as is known, the relationship between accident rates or severity and semitrailer length, particularly within the range 40 to 49 feet, has not been established.²⁷ Second, in terms of capacity, and assuming no shifts in freight between rail and truck, an increase in box size of up to 45 percent reduces the number of truck trips.²⁸ It is unlikely, though, that this reduction would be significant enough to appreciably affect highway capacity anywhere in Canada. This same point — the reduction in the number of truck trips required to carry a given quantity of freight — is related to the first issue of safety: if accident statistics show anything, they suggest accidents are related to exposure (the distance driven); a reduction in kilometres, then, reduces the

²⁷ No reference for this statement can be provided. However, the thesis that there are no statistics in North America that relate either accident rates or accident severity to trailer length (within the range of 40 to 49 feet) has been discussed with two people who have published papers on truck safety. They both agreed that such data does not exist.

²⁸ The increase in cube from an ISO 40' box to a 48' x 102" box is in the range of 28 - 45% (see note #42 below).

number of accidents. Third, given the number of factors involved with splash and spray (mud flaps, tires, speed, trailer design, pavement type, fenders, etc.) and given the absence of data on the relationship between accidents and splash and spray, nothing meaningful on the subject can be developed here. For most trucks, the change being considered is an eight to nine foot increase in length with no change in the number of axles or the basic shape.

Table 2: Semitrailer and Container Length Limits in Canada

	14.65 m limit	14.65 m limit, but permits for longer available	14.65 m limit, but overhang provision	greater than 14.65 m
Newfoundland (a)	14.65			
Prince Edward Island		yes		
Nova Scotia		yes		
New Brunswick (b)			yes	
Quebec				15.5
Ontario (c)	14.65			
Manitoba (d)				16.2
Saskatchewan				16.2
Alberta				16.2
British Columbia				16.2
Yukon		yes		
Northwest Territories				no limit

- (a) Newfoundland is likely to amend its regulation if an ISO container up to 49' came into wide-spread use.²⁹
- (b) Current regulations allow an overhang of up to 1.8 m³⁰
- (c) Ontario has announced that it intends to adopt the 16.2 m standard
- (d) It is not known if 16.2 m is allowed in Winnipeg

²⁹ Newfoundland writes: "The decision to proceed with such an amendment . . . (to allow a container in excess of 14.65 m to move over the roads) . . . would be dependent upon the safety implications of operating longer semi-trailers, and the number of oversize containers in use in the province."

³⁰ It is not clear, however, what happens when New Brunswick formally adopts the RTAC regulations.

9. MARKET FOR LARGER CONTAINERS

9.1 Introduction

Many of those consulted for this study questioned the need for a new freight containers. To some extent, this is the question being given the UN by the ISO technical committee. No attempt has been made here to quantify the market for larger containers — there are too many variables where weak assumptions would have to be made: whether shipping lines will buy ships with the right-sized slots, whether the ISO will decide on future standards, whether US domestic standards will be developed, etc. It is possible, however, to make some observations about the market. In the next section, the background to the development of the market for larger containers is described; an understanding of this is crucial to an understanding of how the system evolved and how it may change in the future. Section #9.3 then describes opinions which suggest there are limits to this market or that the time frame needed for this market to develop is very long. Finally, in Section #9.4 some speculations are made on the basis of the available data in Canada.

9.2 How the Market Developed

The market for large containers developed in the following manner:

- **Freight density:** The first point in the development of the market is the existence of freight with a density of less than (about) 22 to 25 lbs/ft³ (roughly 350 to 400 kg/m³). Anything with a density lower than this "cubes out" in the 40-foot ISO box (the range in densities being a function of container height). That is, it fills the cube of the box before it reaches the maximum allowed weight of 30.48 tonnes (payload plus tare). In the United States, general freight has an average density of about 11 lbs/ft³ and this average has been falling.³¹
- **US truck dimensions:** The US Surface Transportation Act of 1982 established 48 feet (minimum) and 102 inches as the nation-wide standard for semitrailers (other than doubles), thereby giving the trucking industry an important cube advantage over rail and ISO boxes used for either domestic moves (back to tide water) or international moves (from an inland point to a port).
- **US Shipping Act of 1984:** This, among other things, increased competition within the industry by doing away with the requirement that ocean carriers disclose the division of revenues with inland carriers on intermodal moves. It also allowed ocean carrier rate conferences to quote through rates and for each carrier to negotiate the inland portion of this rate by itself; it forbids the rate conference to negotiate these inland rates collectively.
- **Competition within the US transportation industry:** The consequences of the change in truck dimensions and the Shipping Act were that competition increased. Over-simplifying, ocean carriers attempted to penetrate further and further inland to provide a faster and more complete door-to-door service. There was always

³¹ See note #42 for container cubes. The suggestion that US general freight has a density of 11 lbs/ft³ is from the Western Highway Institute, 1980, *Motor Vehicle Size and Weight Standards: Western Regional Objectives*, The TRED Foundation, Western Highway Institute, San Bruno, California.

one problem, though: how to fill the boxes with freight for the backhaul (i.e., from US inland points back to US ports or to overseas destinations).³²

- **Double-stack trains:** Partly as a result of the increased competition, ocean carriers, railways, and ports in the US developed double-stack rail service. The cost of moving a container on a double-stack service is considerably lower than container-on-flat-car ("COFC") service. It has been suggested that linehaul costs for a 45-foot container on a double-stack train in the US are 62 percent of the cost for the traditional 40-foot ISO container on a COFC service.³³ According to the most recent estimates, there are now about 30,000 double-stack spaces (15,000 platforms) on US railways.³⁴ But the development of double-stack rail service created another problem: whereas previously the issue had been primarily one of finding freight to fill international containers on their backhaul, the issue now became one of filling containers and dedicated double-stack trains. The investment in rolling stock, yards, and handling equipment is large. Once committed, the additional cost of handling one more box is low, thereby allowing the seller of the service to offer attractive rates, particularly on the backhaul.
- **Larger boxes:** In attempting to "fill boxes" and now to "fill trains" the railways, the ocean carriers, and new "third party" marketing firms noticed that shippers were wedded to the cube available in the 48-foot (or larger) semitrailer. The solution, then, was the development of containers with more cube. In 1982 American President Lines (APL) introduced the first "high cube" container, with a length of 45 feet and a height of 9.5 feet. Although there were initial problems, Hong Kong, Taiwan, Korea, Singapore, and Japan have now accepted these boxes. They are also being used to some extent on US - European trade routes, although in some cases their use in Europe is limited to a port area only because of clearance problems inland. In 1985 APL introduced the 48-foot (and 102 inch) domestic container; although reports on numbers vary, there appear to be somewhere between 5,000 to 10,000 of these in use. APL, as of the spring of 1989, is negotiating with various ports over the use of these 48-foot containers on Pacific trade routes. More recently, APL has gone even further by ordering 600 53-foot aluminum containers intended for domestic use on double-stack trains.

³² In 1987, there were 4 million tonnes more of inbound containerized international freight in the US than outbound. In 1988, this had declined to 0.2 million tonnes (36.1 million tonnes inbound versus 35.9 million tonnes outbound). The person who presented these figures (US DoT, Nov. 1989) suggests they are evidence of the partial resolution of the "empty backhaul" problem. In other words, increased competition, the development of double-stack trains, and other factors, such as introduction of third party marketing agencies, have been successful in finding freight to fill international boxes on their outbound trips.

³³ Temple, Barker, Sloan, Inc., presentation to the Halifax Ports Days, September 21, 1987. A paper by the US government to the Inland Transport Committee meeting of June 9-12, 1989 used the following figures when discussing APL's introduction of double-stack 48' containers: "With overall cost savings of 25 per cent and line haul savings of around 40 per cent compared with conventional intermodal operations, stack train technology is quickly penetrating high volume containerized markets."

³⁴ US DoT, Nov 1989.

9.3 Views on the World Market

The previous section paints a picture of a market for large containers developing rapidly and rolling inexorably over the world's transportation system. It may be incorrect to see these North American developments in this light:

- There are five million TEU containers in existence world-wide. Only 100,000, or two percent, are wider than 8 feet or longer than 40 feet. According to some observers, there is a lot of "hype" about the growing use of non-standard boxes.³⁵
- "There is some doubt as to the extent to which there is a genuine demand for new generation boxes, in the short to medium term at least. Within the leasing industry, the consensus of opinion is that there is unlikely to be a world wide move towards the 48ft or 49ft containers, as these are primarily a response to developments in the US domestic transportation market, which are not in evidence elsewhere."³⁶
- Although there has been a rapid increase in large boxes in the United States, so far the only ones used on overseas trade are the 45-foot ones with standard ISO widths. The point is, then, that there is no evidence the 2.6 metre or the 102 inch width will necessarily be anything more than a North American phenomena.³⁷
- In a comment about the possible US domestic container standards, a US official notes that the containers that will be built according to this standard (i.e., the 102" or 2.6 m by either 45' 48' or 53') "will not be suitable for the marine mode (except possibly on river barges)."³⁸
- A comment made by a US official at the November meeting of the European Inland Transport Committee in Geneva: "It is too soon to speculate as to the extent the larger container lengths and the associated operating practices, now being established in the United States domestic transportation system, will carry over into the international maritime trades."³⁹
- The managing director of a UK firm which markets containers makes the following points:

³⁵ *Container Management*, Aug. 1989.

³⁶ *Container Management*, May 1989.

³⁷ US government's presentation to the June, 1989 meeting of the Inland Transport Committee. Admittedly, since then, there have been reports that APL is negotiating with some ports to use its 102" containers on marine service.

³⁸ Paper sent out by the US DoT in April of 1989.

³⁹ US DoT, Nov 1989.

- (i) "... irrespective of a new standard being 48ft, 49ft or 53ft long, and 8ft 6in wide, ... such a container will never fit the cell guides of a vessel built to take 20ft and 40ft boxes which are only 8ft wide."
- (ii) most of the cranes used to unload containers from ships cannot handle containers 49 feet or longer⁴⁰; and
- (iii) the introduction of a new large container with a length of 49 to 53 feet "will entail vastly expensive changes in virtually all of the hardware we use today." (i.e., cranes, spreaders, chassis).

Nevertheless, this person also believes it would be foolish for Europeans to resist the US pressures for larger containers. It would be far better, he argues, "to continue the dialogue in the knowledge that such a container will remain impractical for many operators for the foreseeable future, but to ensure that the half-size (be it 24ft, 24.5ft, or 26.5ft) is a 'pallet' friendly dimension."⁴¹

9.4 The Canadian Market

A quantitative analysis of the Canadian market has not been made. Nevertheless, there is data to suggest that shippers would benefit from these boxes. In the following, three pieces of data are examined: freight densities in current ISO containers, port data on tonnes per loaded TEU, and a distribution of container weights supplied by CN Rail.

Current ISO 40-foot boxes cube out when loaded with freight having a density of less than (about) 22 to 25 lbs/ft³ (roughly 350 to 400 kg/m³), depending on the height of the box.⁴² While no comprehensive data has been located on freight densities in Canada, either for domestic or overseas shipments, it is widely believed that general freight is in the range of 10 to 15 lbs/ft³ (160 - 240 kg/m³) — recall the suggestion in Section #9.2 that US general freight averages 11 lbs/ft³. On this basis alone, then, a case can be made that there is a demand for containers with

⁴⁰ It is not clear that this is a major problem in Canada. Most of the new cranes have a clearance of 50 feet between the legs making it (just) possible to handle 49' containers. Some operators, though, point out that if there is any wind a clearance of 6" at either end is inadequate.

⁴¹ The author, Keith Elliot, is managing director of Cargo Unit Containers of Frimley, UK.

⁴² 42. The following show typical cubes and payloads for some APL containers. Note that the sum of tare plus payload does not necessarily equal maximum ISO ratings; for example, one of the 45' containers shown has a gross weight of 72,800 lbs (33 t).

type	dry cargo	dry cargo	dry cargo	refrigerated	dry cargo	dry cargo	dry cargo
length	20'	40'	40'	40'	45'	48'	53'
height	8.5'	8.5'	9.5'	9.5'	9.5'	9.5'	9.5'
width	8'	8'	8'	8'	8'	8.5'	8.5'
ft ³	1186-1158	2397-2390	2715-2700	2338-2315	3050-3043	3490-3450	3830
tare-lbs	3800-5490	6460-8380	6800-8230	9480-10670	8550-10250	8100-9900	10750
payload	47840-39380	60740-58820	60400-58970	57720-56680	64250-56950	59100-57300	56450
density							
lbs/ft ³	40.3-34.0	25.3-24.6	22.2-21.8	24.7-24.5	21.0-18.7	16.9-16.6	14.7
kg/m ³	646-545	406-394	356-350	395-392	337-300	271-266	236

more cube than the 2400 to 2700 feet available in ISO 40-foot containers (68.0 - 76.5 cubic metres, depending on the height). This argument is borne out by the rapid acceptance of 48-foot (and, presumably soon, 53-foot) semitrailers within the trucking industry — shippers benefit from the increased cubic capacity and the consequent reduction in transportation costs.

Second, consider the data from the three ports shown in Table 3. Although more detail (distributions, standard deviations) and a consistent format would have been desirable, there is still enough information to indicate that many ISO boxes are being used at weights below their maximum capacity. The typical ISO container payload capacity is about 21.5 tonnes for a new 20-foot container, about 18.0 tonnes for an old 20-foot container, and about 27.4 tonnes for a 40-foot container (or 13.7 tonnes per TEU). None of the averages on Table 3 approach these numbers.

Table 3: Container Load Sizes(a)

	<u>Halifax</u>	<u>Montreal(b)</u>		<u>Vancouver(c)</u>	
	tonnes per loaded TEU	tonnes per loaded TEU	40ft as % of total	tonnes/loaded TEU inbound	outbound
1971	9.83				
1972	0.20				
1973	10.20				
1974	9.98				
1975	9.85				
1976	9.76				
1977	9.81				
1978	10.36				
1979	9.50				
1980	9.60				
1981	9.46	11.76	23.8%		
1982	5.62	11.57	27.7		
1983	9.56	11.71	29.2		
1984	9.69	11.64	30.0	9.25	12.83
1985	9.65	11.50	32.5	8.65	12.66
1986	10.16	11.32	34.8	8.47	12.53
1987	9.99	11.27	36.9	8.33	12.60
1988	10.07	11.41	35.8	8.24	12.54

(a) Data developed from statistics supplied by ports.

(b) Montreal is the only port with data on loaded 20 and 40-foot boxes.

(c) Excludes domestic containers; Vancouver is the only port where both tonnes and TEU can be separated on an inbound/outbound basis.

Observations on the data in Table 3 are:

- (i) with a TEU capacity of somewhere between 13.7 and 21.5 tonnes per TEU (depending on the mix of 20 and 40-foot containers), it can be seen that average loads are filling the cube of the box before the weight capacity;
- (ii) there is a slight trend to lighter loads and more 40-foot boxes in Montreal and there is something approaching a trend in Vancouver to lighter inbound containers; and
- (iii) as shown by the data from Vancouver, outbound containers are considerably heavier than inbound ones.

The explanation for this last point is simply that the freight used to fill containers out of Canada tends to be the heavier semi-manufactured or raw product versus the light consumer products being shipped into the country.

The third and last piece of data is supplied by CN Rail and described in the appendix. For here, there is one primary observations: a large number of containers are loaded with freight of very low densities. The numbers in Table 4 show this (note that the containers shown in the first category may include some that are empty).

Table 4: CN Rail Container Weights(a)

	<u>import containers</u>		<u>export containers</u>	
	20'	40'	20'	40'
ISO maximum weights				
tons	26.46	33.60	26.46	33.60
tonnes	24.00	30.48	24.00	30.48
Percent distribution, CN Rail containers, gross weight less than:				
5 tons (4.54 t)	4.3	1.1	2.6	0.2
10 tons (9.07 t)	16.6	16.8	11.3	5.3
15 tons (13.61 t)	26.1	40.5	18.3	12.5
20 tons (18.14 t)	43.3	56.7	28.2	20.4
25 tons (22.68 t)	81.9	75.8	92.8	35.5
Calculated freight densities for containers with gross load less than: (b)	<u>20' box</u>		<u>40' box</u>	
	lbs/ft ³	kg/m ³	lbs/ft ³	kg/m ³
5 tons (4.54 t)	3.9	62.8	1.3	21.4
10 tons (9.07 t)	12.5	200.9	5.5	88.1
15 tons (13.61 t)	21.2	338.9	9.7	154.8
20 tons (18.14 t)	29.8	476.9	13.8	221.5
25 tons (22.68 t)	38.4	615.0	18.0	288.2

(a) Supplied by CN Rail, based on a sample of 40,000 1989 containers.

(b) For a 20' box, calculations assume a tare of 4550 lbs (2.06 t) and a cube of 1160 ft³ (32.9 m³); for a 40' box, calculations assume a tare of 6800 lbs (3.08 t) and a cube of 2400 ft³ (68.0 m³).

For example, about 17 percent of all import containers weigh less than 10 tons (9.1 t); or, stated another way, about 17 percent of the 20-foot containers are moving freight with a density of less than 12.5 lbs/ft³ and about 17 percent of import 40-foot boxes are moving freight with a density of less than 5.5 lbs/ft³. (To the extent any of these 40-foot boxes are 9.5' high, densities would be even lower than those calculated here.) Over 40 percent of the import 40-foot boxes are moving freight with a density of less than 9.7 lbs/ft³ and almost 57 percent are carrying freight with densities of less than 13.8 lbs/ft³. There is a clear need for larger containers for freight moving into Canada. The need for these large boxes on outbound movements is less dramatic, but it is still there: 20 percent of the outbound 40-foot boxes are moving freight with densities of less than 13.8 lbs/ft³.

10. IMPACT OF LARGE CONTAINERS AND THE NEED FOR POLICY CHANGE

To understand the impact of large containers, it is best to look to the United States where, since the mid-1980s, new containers have been rapidly gaining market share. This is a result of several factors: regulatory changes, double-stack trains, and new 45, 48, and (a few) 53-foot containers.

First, largely because of regulatory change, truck/rail competition has intensified. There is a debate, though, as to whether or not the railways are actually winning any significant volumes back from the trucking industry; this may not be important here as the main point is simply that competition has intensified. One of the results of this increased competition has been the use of containers to move domestic freight. A subsidiary of APL is now moving 270,000 annual loads of domestic freight in containers in the US. Based on first-quarter data compiled by the Association of American Railroads, it is anticipated that American railroads will handle in total 5 million TEUs, domestic and international, in 1989.⁴³ Double-stack cars for containers now represent 25 percent of the total intermodal carrying capacity of US railways.⁴⁴ Two railways, Union Pacific and Santa Fe, have announced that they intend to cease their piggyback operations and concentrate solely on container services.⁴⁵

Second, transportation costs have been lowered. The US representative at the recent meeting of the Inland Transport Committee in Geneva used these figures to describe domestic containerization: "If a full train of double-stack cars is operated, the linehaul costs can be reduced by forty per cent. However, because of the terminal and chassis requirements, total costs may be reduced by only 20 to 25 per cent."⁴⁶ "Only" a 20 to 25 percent reduction in total door-to-door transportation costs is a significant impact on the transportation system.

In terms of actual rates, a June, 1989 article makes the following observation: "Reportedly, the Santa Fe's 48ft container rate for Chicago/LA has already slipped below US \$1,000 (CDN \$1,180)."⁴⁷ By comparison, the 1988 rate (including the terminal charge) for a 40-foot container from Halifax to Toronto — about half the Chicago/LA distance with about 70 percent of the cubic capacity — was \$858 to \$889 depending on the direction.⁴⁸ While this anecdotal evidence hardly qualifies as a rate analysis, it does at least suggest there is strong evidence that American shippers are benefiting from the introduction of large containers.

⁴³ F.E. Phillips, "Why Atlanta's Rails Don't Scare Truckers Yet," *Containerization International*, June 1989.

⁴⁴ US DoT, Nov 1989, p 4.

⁴⁵ *Ibid.*, p 2.

⁴⁶ *Ibid.*, p 5.

⁴⁷ *op. cit.*, F.E. Phillips, June 1989.

⁴⁸ CFA Tariff #7589E, EB Tariff - Item 1225 (c)(58), WB - Item 1220. The rate is for annual volumes in excess of 18,000 containers.

It does not follow, though, that the changes seen over the past few years in the United States will be seen in Canada if either overseas or domestic freight moves in larger containers. The railways point out that it takes a certain volume of traffic to sustain a double-stack operation and, according to them the volumes are not yet here in Canada. Both railways have experimented with double-stack.

What will likely happen is this: whether or not the ISO makes a decision on standards for large containers, Canada will be affected simply because of the proximity to the United States. In fact, one recent article suggests there may be a significant diversion of Canadian traffic to the US system, either the long-haul moves of overseas containers or, even, Canadian domestic traffic which is attracted south of the border because of the cheaper rates.⁴⁹ There are now American 48-foot containers showing up in the Toronto region "looking" for backhaul traffic to Chicago or clear through to the west coast. Even without the proximity of the United States, it is clear that Canada will adapt to the use of large containers: both railway are developing their own domestic large container program, with CP Rail's 48-foot containers already operating.

It is not known if this use of large containers will spread into Canada's overseas trade. If it does, the evidence from Sections #5 to #8 above is that there will be few problems. Admittedly, some equipment may have to be replaced before it is fully depreciated if the switch to large containers is rapid. By all accounts, though, it is unlikely that it will be. There is simply too much invested in the current 20 and 40-foot ISO containers and ships for it all to disappear overnight.

Finally, given that there do not appear to be any major problems with the over-the-road movement of containers 48 to 49 feet in length, there do not appear to be any major policy changes required by any level of government. If industry does need assistance, the role of the government should simply be in support of whatever standards industry experts feel best fulfil the needs of four goals:

- (i) a standard that is compatible with or causes the least disruption to over-the-road dimensional limits;
- (ii) a standard that is compatible with the most common unit load and pallet sizes;
- (iii) a standard that allows the development of a complimentary "half-size" container that is also optimal with respect to widely-used unit load and pallet sizes; and
- (iv) a standard that allows the movement of low-density freight in a more efficient manner than that now possible with existing ISO containers.

⁴⁹ McDonald, J.W., 1989, "Following the Tracks: A Challenge to Canadian Ports and Railways," *Portus*, pp 28 - 32.

APPENDIX A
PERSONS, ORGANIZATIONS CONTACTED

Alberta Intermodal Services, Calgary, Mr. W.A. Danzinger, GM & CEO

Canadian Freightways Ltd, Calgary, Mr. Darshan Kailly, President & GM

Canadian Manufacturers' Association, Toronto, Mr. Don Wiersma

Canadian Standards Association, Toronto, Mr. L.G. Bortolin, Senior Administrator

Canadian Stevedoring Company Ltd. (Centerm), Vancouver, Mr. Michael Templeton, Vice-President Finance & Administration

Cast Terminal, Montreal, Mr. Kevin Doherty, Executive Vice-President

Cerescorp Inc., Halifax, Mr. Klaus von Borries, General Director

CN Rail, Montreal, Mr. Ken Moffatt, Manager, Facilities and Services Planning, Intermodal; Mississauga, Mr. Al Gibson & Mr. Doug Smith.

CP Rail, Montreal, Mr. Mike Csaky, Manager, Equipment Development, Intermodal Operations

D. W. Francis & Associates, Thornhill, Mr. Don Francis, President (Canada's representative on the ISO committee)

Empire Stevedoring Company Ltd. (Vanterm), Vancouver, Mr. P.T. Senior, President

Empire Stevedoring Co. Ltd. (Bikerdike Terminal), Montreal, Mr. Andrew Chodos, Assistant to the President

Halifax Port Corporation, Halifax, Ms Lori Rafter, Manager of Marketing Services

Halterm Ltd., Halifax, Mr. Murray Graves, Administrative Manager

Port of Montreal, Montreal, Mr. Frank Martini, Director of Marketing

Racine Terminal, Montreal, Mr. Daniel Belisle, Assistant General Manager

Stinson Transportation Systems Inc, Delta, Mr. D. Stinson, President & GM

Termont Terminals Inc, Montreal, Mr. Roger Carre, GM

Transport Canada, Ottawa, Mr. John MacDonald, Transportation Economist

Vancouver Port Corporation, Vancouver, Mr. K. G. Little, Manager Marketing

APPENDIX B

DATA

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B.1 Statistics Canada's Data¹

Total Container Movements Through Canadian Ports

	Domestic Tonnes	International Tonnes		Total
		Inbound	Outbound	
1982		2,740,300	3,774,400	6,514,600
1983	639,400	3,540,600	3,940,600	7,481,200
1984	524,400	4,323,100	4,243,800	8,566,800
1985	652,900	4,547,500	4,545,700	9,093,200
1986	1,510,000	4,769,500	5,029,900	9,799,300
1987	1,431,100	5,155,400	5,691,900	10,847,300
1988 (preliminary)	984,854	5,777,708	6,815,191	12,592,899

B.2 Port of Montreal

(A) Total Tonnes and TEUs²

	TEUs			Tonnes		
	Inbound	Outbound	Total	Inbound	Outbound	Total
1984	217,149	211,598	428,747	2,363,037	1,786,271	4,149,308
1985	245,407	236,118	481,525	2,601,342	1,821,363	4,422,705
1986	270,373	261,152	531,525	2,783,878	2,158,263	4,942,141
1987	284,276	290,246	574,522	2,948,959	2,579,184	5,528,143
1988	276,095	284,346	560,441	2,881,661	2,850,260	5,731,921
1989 - first half						2,670,143

(B) 20-foot versus 40-foot Containers³

		1988		1987	
		total	% of total	total	% of total
Full	20'	237,354	57.6%	225,981	53.9%
	40'	132,554	32.2%	132,328	31.5%
	total	369,908	89.8%	358,309	85.4%
Empty	20'	25,837	6.3%	38,687	9.2%
	40'	16,071	3.9%	22,599	5.4%
	total	41,908	10.2%	61,286	14.6%
Total	20'	263,191	63.9%	264,668	63.1%
	40'	148,625	36.1%	154,927	36.9%
	total	411,816	100.0%	411,816	100.0%

¹ Statistics Canada, #54-205, 1987, p 93.

² The Montreal Port Guide and Transportation Register, 1989, p 72; plus information for 1989 supplied by the Montreal Port Corporation.

³ Data supplied by the Port of Montreal.

B.3 Port of Vancouver⁴

	TEUs			Tonnes		
	Inbound	Outbound	Total	Inbound	Outbound	Total
1984	71,969	79,582	151,551	554,413	845,965	1,400,378
1985	78,953	99,222	178,175	527,100	1,083,211	1,610,311
1986	100,367	122,414	222,781	709,608	1,291,247	2,000,855
1987	132,449	148,328	280,777	915,969	1,492,607	2,408,576
1988	152,664	153,074	305,738	1,074,364	1,657,457	2,731,821

B.4 Port of Halifax⁵

(A) Total Container Movements and Total Tonnes, 1984 - 1988

Year	Inbound & Outbound Container Traffic				Average tonnes/ loaded TEU
	tonnes	Loaded TEUs	Empty TEUs	Total TEUs	
1984	1,983,103	204,663	56,785	261,448	9.69
1985	1,953,636	202,487	60,572	263,059	9.65
1986	2,264,572	222,912	47,850	270,762	10.16
1987	2,792,194	279,615	52,151	331,766	9.99
1988	3,537,169	351,400	60,766	412,166	10.07

(B) Total Container Movements, by size, by direction, by load 1988

		inbound	outbound	total	% of total
Full	20'	48,938	46,308	95,246	36.4%
	40'	56,867	71,210	128,077	48.9%
	total	105,805	117,518	223,323	85.3%
Empty	20'	5,450	10,780	16,230	6.2%
	40'	15,429	6,839	22,268	8.5%
	total	20,879	17,619	38,498	14.7%
Total	20'	54,388	57,088	111,476	42.6%
	40'	72,296	78,049	150,345	57.4%
	Total	126,684	135,137	261,821	100.0%
% of Total	20'	20.8%	21.8%	42.6%	
	40'	27.6%	29.8%	57.4%	
	total	48.3%	51.6%	100.0%	

⁴ Vancouver Port Corporation, "1988 Statistics" Figures shown include both foreign and domestic movements.

⁵ Data provided by the Halifax Port Corporation.

B.5 Summary of Port Data

Data from the individual ports, and other sources, suggest the following movement of containerized traffic through Canadian ports:

	'000 of TEUs			'000,000 tonnes		
	1986	1987	1988	1986	1987	1988
Halifax	271.0	331.8	412.2	2.3	2.8	3.5
St John	60.2	25.4	17.0			0.1 ⁶
Montreal	531.5	574.5	560.4	4.9	5.5	5.7
Vancouver	222.8	280.8	305.7	2.0	2.4	2.7
Fraser Port	8.0					⁷

B.6 Rail Data⁸

(A) Overview of Total Intermodal Moves

		CN	CP
1987	TEUs	360,000	395,000
	trailers (& CP domestic containers)	250,000	120,000
1988	TEUs	480,000	446,000
	trailers (& CP domestic containers)	225,000	116,000

(B) Total Containerized Rail Traffic in Canada⁹

	'000 tonnes
1972	2,956.4
1974	4,065.4
1975	3,558.1
1980	4,596.4
1984	6,407.1

For 1984, 71.6% of this total consists of international containers (presumably this is international traffic with a Canadian origin or destination, passing through a Canadian port), 12.6% transborder traffic (presumably this is international traffic with either a Canadian or American origin or destination using either a Canadian or American port, but moving by rail across the Canada/US border), and 15.8% domestic traffic.

⁶ Data on TEU for St John is from *Containerization International*, October 1989; data on the number of tonnes for 1988 is from *Canadian Sailings*, Oct 9, 1989, p 43.

⁷ Data for Fraser Port from *op. cit.*, F.E. Phillips, May 1988.

⁸ The 1987 data from *op. cit.*, F.E. Phillips, May 1988. Both railways confirmed these figures. The 1988 data was obtained by phone from the railways.

⁹ Archambault, M., 1987, *Developments in Intermodal Transport in North America*, Transport Canada, TP 8848, Ottawa, p 35.

(C) Distribution of International Container Weights (CN Rail, 1989)

The following data, supplied by CN Rail, is based on a sample of 40,000 international containers for the year 1989. Each container was weighed by CN Rail. Although the data supplied here does not show this, generally the reported weights were close to actual weights. (Many of the those contacted for this research claimed that there is a discrepancy between these two figures.) The source data was compiled into imperial weight categories.

Percent Distribution of Container Gross Weights

<u>Weight Categories</u>		<u>Import Boxes</u>		<u>Export Boxes</u>	
metric tonnes	metric	20'	40'	20'	40'
0.00 - 4.54	0 - 5	4.3%	1.1%	2.6%	0.2%
4.54 - 9.07	5 - 10	12.31	5.7	8.7	5.1
9.07 - 13.61	10 - 15	9.5	3.7	7.0	7.2
13.61 - 18.14	15 - 20	17.2	16.2	9.9	7.9
18.14 - 22.68	20 - 25	38.6	19.1	64.6	15.1
22.68 - 27.22	25 - 30	16.0	16.7	6.9	28.3
27.22 - 31.75	30 - 35	0.6	6.4	0.1	36.0
31.75+	35+	1.4	1.1	0.1	0.3

Cumulative Percent Distribution of Container Gross Weights

<u>Weight Categories</u>		<u>Import Boxes</u>		<u>Export Boxes</u>	
metric tonnes	tons	20'	40'	20'	40'
0.00 - 4.54	0 - 5	4.3%	1.1%	2.2%	0.2%
54 - 9.07	5 - 10	16.6	16.8	11.3	5.3
9.07 - 13.61	10 - 15	26.1	40.5	18.3	12.5
13.61 - 18.14	15 - 20	43.3	56.7	28.2	20.4
18.14 - 22.68	20 - 25	81.9	75.8	92.8	35.5
22.68 - 27.22	25 - 30	97.9	92.5	99.7	63.8
27.22 - 31.75	30 - 35	98.5	98.9	99.8	99.8
31.75+	35+	99.9	100.0	99.9	100.1

Observations on this data are:

- Few boxes exceed the ISO maximum weight standards. Only 2.0% of the import 20' boxes and 0.2% of the export 20' boxes are clearly in weight categories above the 24 t ISO limit. Only 1.1% of the import 40' boxes and 0.2% of the export 40' boxes are likewise clearly in weight categories which exceed the ISO 30.48 t limit. Unfortunately, because of the weight categories chosen, it is not possible to know anything more about over-weight boxes.
- The heaviest containers are the 40' export boxes: 36.3% of these weigh more than 30 tons (27.2 t), versus only 7.5% of the import 40' boxes, 2.0% of the import 20' boxes, and 0.2% of the export 20' boxes.

- Import containers are considerably lighter than export containers: close to 17% of both 20' and the 40' import boxes weigh less than 10 tons (9.1 t), whereas only 11% of the export 20' boxes and 5% of the export 40' boxes are this light.

B.7 Truck Data

Statistics Canada reports that for the latest year available (1987) that the trucking industry (Canadian domiciled, private and for-hire) handled just over 300 million tonnes of freight. The for-hire sector handled 33.7 million shipments.¹⁰ This includes transborder freight. Nevertheless, there are exclusions in these figures: transborder freight handled by a US domiciled carrier, freight hauled by small private trucking firms, and freight handled by specialty carriers (parcel, etc.).

Of this total of 300 million tonnes, Statistics Canada develops detailed origin-destination data on the basis of the 169 million domestic tonnes hauled by the class I and II for-hire carriers (domestic inter-city revenues of greater than \$500,000). While information on containers handled by these carriers is not directly available--shipments are coded according to the commodity, not the method of conveyance--there is one partial bit of information. The tenth largest shipment handled (as measured by "number" of shipments, as compared to "weight," "tonne-kilometres," or "revenues") is "shipping & distribution containers." In total, 503,270 such shipments were recorded by the class I & II for-hire carriers in 1987. To be included in the sample, these shipments have to be both domestic, and to have a shipping distance of over 25 kilometres.

The complete list of commodity "951" (containers) is lengthy; it includes such things as empty bottles, bags, cartons, and so on. It also includes "empty freight box" and "empty container." Statistics Canada has provided the following information on commodity 951:

distance (km)	# ship. ('000)	\$/ship	tonnes/ ship.	km/ship
25 - 79	70.1	115.71	5.295	54
80 - 149	68.0	123.31	3.450	111
150 - 299	104.4	135.75	3.361	220
300 - 549	93.7	177.21	3.960	409
550 - 1,099	82.2	227.95	2.765	751
1,100 - 2,999	54.3	283.63	2.022	1,799
3,000+	<u>30.5</u>	283.16	0.957	3,947

503.3

The tare weight of ISO containers are in the range of 2.0 t (20') to 4.0 t (40' steel). There is a possibility, then, that a many of the shipments within commodity 951, particularly those moving less than 300 km are empty freight containers.

In addition to these statistics on the class I and II for-hire carriers, the latest StatsCan data also shows that "containers and closures" were an important commodity for the class III carriers.¹¹ While number of shipments is not given, total tonnes of 312,000 could be used along with the average 3.36 tonnes for the class I and II carriers to impute the number of container moves: $312,000/3.36 = 92,857$. Further still, in a new survey of Canada-US trucking (by Canadian-

¹⁰ 59. Statistics Canada, cat #53 222, 1989.

¹¹ *Ibid.*, p 115

domiciled carriers), the latest figures show 9,928 movements of containers from Canada to the US on the west coast¹² and 10,940 movements from the US west coast to Canada.¹³ Here, though, average weights are 17.26 and 18.05 tonnes respectively--suggesting a different method of coding commodities perhaps (i.e., these are clearly not empty containers).

In any case, and while the data is incomplete (e.g., on the Canada-US movements, the only data shown here is where "containers and closures" are an important enough commodity to be listed in the partial figures given in the published data), the above data suggests at least the following number of container movements in 1987:

large for-hire carriers, on domestic routes (even if containers were on an international trip)	
- empty (say half the 503,270)	251,635
- assumed full movements (coded as a commodity)	251,635
small for-hire, on domestic routes	
- empty (say half the 92,857)	46,429
- assumed full movements (coded as a commodity)	46,428
international movements (west coast only, all containers full)	<u>20,868</u>
Total	616,995

This estimate of 0.6 million container movements is speculative. Perhaps an equally valid method would be to assume simply that each of the 1.2 million TEUs (1987) of import and export boxes moved on a truck at least once. If all these TEUs actually moved empty after or before a loaded move, the trucking industry might actually have handled 2.4 million TEUs. This estimate still ignore domestic and transborder containers.

B.8 Transborder Data¹⁴

	<u>'000 of TEUs</u>				
	1982	1985	1986	1987	1988
1) US TEUs handled at Cdn ports	100.2	148.0	180.8		
2) Canadian TEUs handled at US ports	<u>100.5</u>	<u>127.6</u>	<u>146.7</u>	—	—
3) Difference (row #1 less row #2)	- 0.3	20.4	34.1	74.5	85.3

¹² *Ibid.*, p 125

¹³ *Ibid.*, p 129

¹⁴ Data for 1982 to 1986 is from M. Archambault, 1988, "L'Intermodalisme et L'Acheminement des Trafics Maritimes de Lignes Regulieres," *Proceedings*, CTRF annual conference, Minaki Lodge, p 132. The 1987 and 1988 data is from Ports Canada, Corporate Services, from data supplied by Customs & Excise, Revenue Canada.

B.9 US Data¹⁵

Because of the concern with overweight containers, the FHWA conducted a survey for the period October 1987 to September 1988 (a 3.3% sample of the "PIERS" data file). While the report labels the data as "container shipments moving through US ports," in the text the authors point out that data from Halifax and Vancouver are included. Presumably, these are containers with a US origin or destination moving through Canadian ports (it is assumed the purely Canadian movements are excluded). It is also likely that Canadian containers moving through US ports are included. The data suggest the following:

- (a) the split between 20-foot and 40-foot containers is roughly 1:2 (i.e., about 64% of all international container movements in the US occur in 40-foot boxes);
- (b) about 40% of the 20-foot containers weigh more than 17.2 tonnes (the break point for "overweight" in the United States);
- (c) about 30% of the 40-foot containers weigh more than 20.0 tonnes (again, the breakpoint for overweight).

No other information on averages or distributions can be gleaned from this source.

Total Sample (Oct '87 - Sept '88)

	<u>Number of Containers</u>					
	Inbound	%	Outbound	%	Total	%
20-foot	18,588	41.1	19,259	32.2	37,847	36.1
40-foot	<u>26,608</u>	<u>58.9</u>	<u>40,408</u>	<u>67.7</u>	<u>67,016</u>	<u>63.9</u>
Total	45,196	100.0	59,667	100.0	104,863	100.0

Overweight

For the purposes of US federal weight regulations, a 20-foot container is judged to be overweight if it weighs more than 38,000 lbs (17,234 kg) and a 40-foot container is judged to be overweight if it weighs more than 44,000 lbs (19,955 kg).

	Inbound	%	Outbound	%	Total	%
20-foot	7,448	40.1	7,709	40.0	15,157	40.0
40-foot	4,527	17.0	15,506	38.4	20,033	29.9
Total	11,975	26.5	23,215	38.9	35,190	33.6
TEUs	16,502	23.0	38,721	38.7	55,223	32.1

While use of different weight breaks make comparisons difficult, the following shows the CN Rail data for 1989 (Section B.6) in categories as close to the above as possible.

¹⁵ US Federal Highway Administration, 1989, "Analysis of Port Import/Export Reporting Service (PIERS) Data to Reveal Potentially Overweight Container Movements on America's Highways," Transportation Studies Division, Office of Policy Development, Washington, D.C., Table 1-A.

	Inbound	Outbound
20-foot over 18.14 tonnes	56.6%	71.7%
40-foot over 22.68 tonnes	24.2%	64.6%

Clearly, Canadian or, at least, CN Rail containers are considerably heavier than American marine containers.